STORMWATER MANAGEMENT AND URBAN RUNOFF

National Water and Sanitation Summit, 18/19 February 2022
Commission 4: Water shortages – Delivery mechanisms by municipalities and water boards

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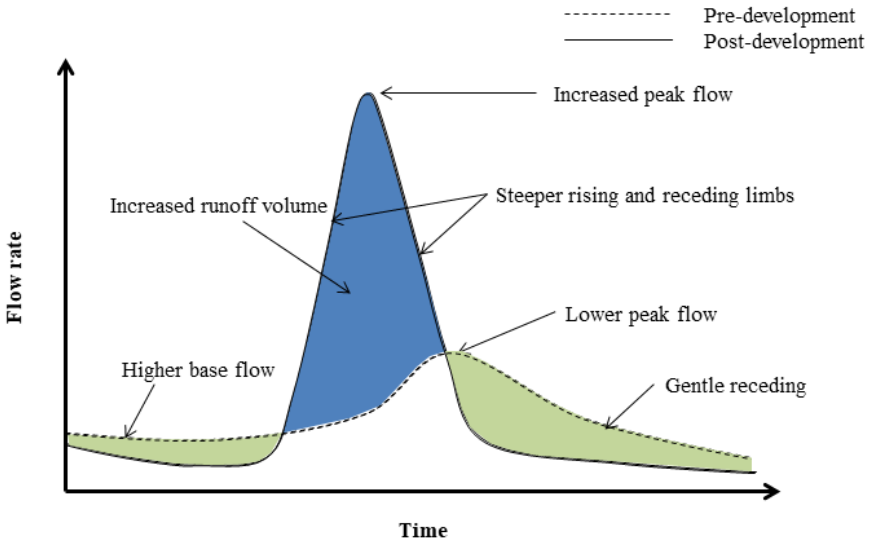
18 February 2022

Water security and the urban stream syndrome



The pursuit of the engineered solution to exploit water systems is paradoxically coming at the expense of longer-term water security, particularly from the impact of vast quantities of untreated wastewater entering the environment

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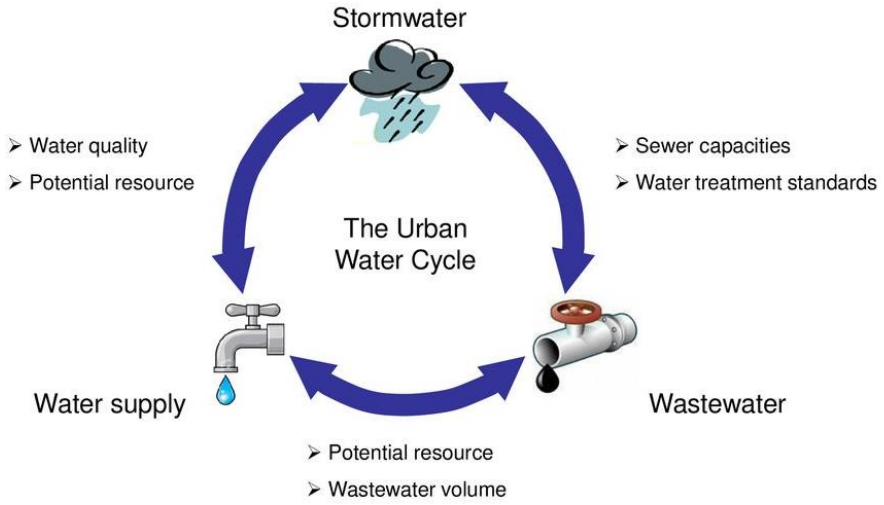
Urban water cycle management



- Fragmented ‘silo-management’ institutional structutes; stormwater management usually undertaken by Roads
- Stormwater as hazardous waste
- Water supply separated from sewage collection and treatment
- Management of urban water often sidelines adoption of ecological focus

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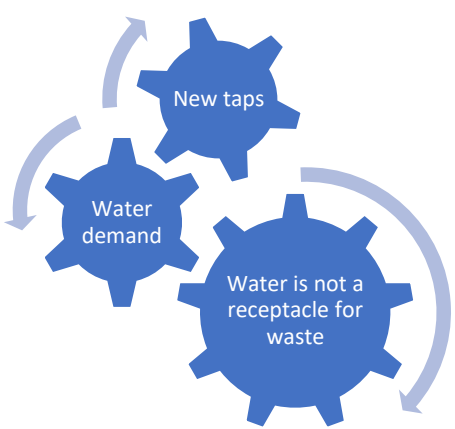
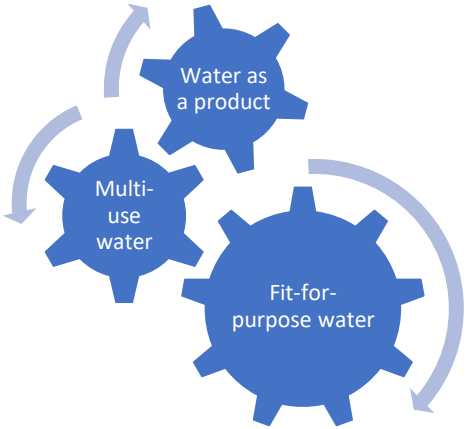
‘Future proofing’ cities with Water Sensitive Design (Wong, 2012)

- Multi-functional infrastructure - hybrid between centralised and decentralised; meet basic needs, enhance aspirational needs
- Blue / green corridors integral elements of city’s drainage infrastructure for flood conveyance
- Enhancing water-food-energy-waste nexus
- Influence of socio-technical dynamics
- Stormwater as a resource / Sponge cities
- Reuse, recycle, remediate
- Diversified water sources



New sources



New thinking

Design principle – keep water in the town / city

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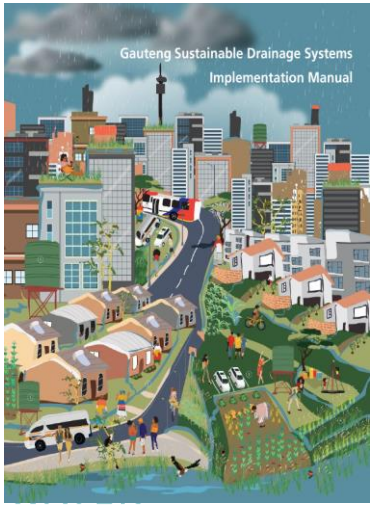
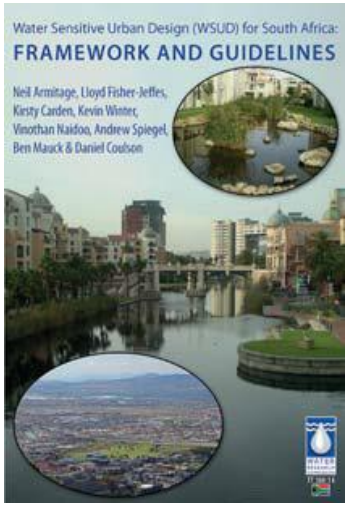
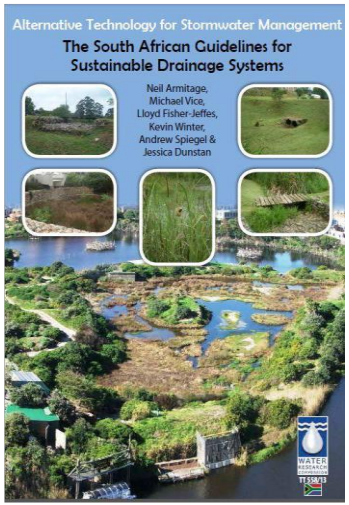
WSD in South Africa

"In its broadest context, WSD encompasses all aspects of integrated urban water cycle management, including water supply, sewerage and stormwater management. It represents a significant shift in the way water and related environmental resources and water infrastructure are considered in the planning and design of cities and towns, at all scales and densities"

(Fletcher *et al.*, 2014)







How important is stormwater?

- Stormwater to be included as a new water source to recharge aquifers
- Stormwater not only contributes to recharge, but is a source of surface and groundwater pollution, as well as a transporter of solid waste and contaminated water to rivers, to waterways and to the sea
- Stormwater is a key element of water resource management to the City; needs greater portion of the budget, linked to the bulk water supply chain, placed within W&S departments
- Must be monitored – private borehole abstraction; state of aquifers; rehabilitation of urban river systems; liveable waterways

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WWDR 2018 - Nature-based solutions for water

"Working with nature, rather than against it, would enhance natural capital and support a resource-efficient and competitive circular economy"

- Micro / personal - dry toilets
- Urban - green walls, roof gardens, infiltration basins (SuDS / WSD)
- Landscape - conservation agriculture
- Rural / catchment – restoration, alien clearing

- Managing water availability
- Managing water quality
- Managing water-related risks
- Enhancing water security – multiplying the benefits

Identify the most appropriate, cost-effective and sustainable balance between grey infrastructure and NBS considering multiple objectives and benefits

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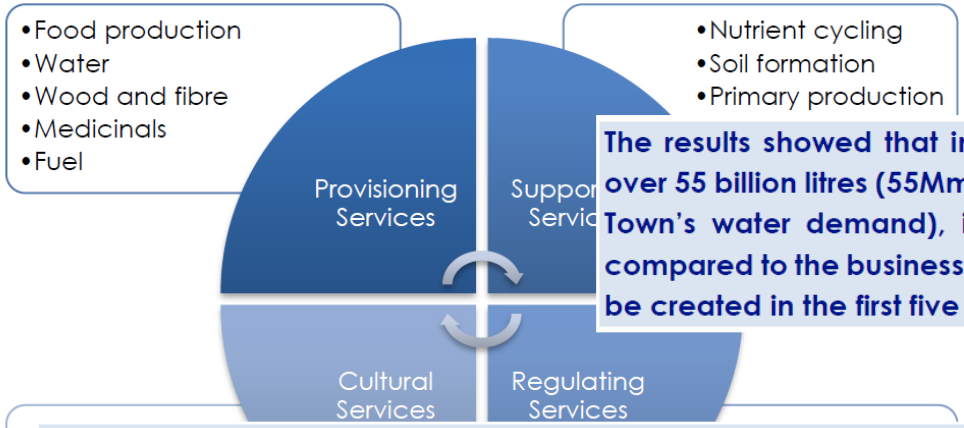
Ecological infrastructure and ecosystems services



The results showed that investing R372 million would generate annual water gains of over 55 billion litres (55Mm³) within six years (equivalent to one-sixth of the City of Cape Town's water demand), increasing to 100 billion litres (100Mm³) within thirty years, compared to the business as usual scenario. Approximately 350 job opportunities could be created in the first five years of implementation through removing alien plants.

It argues that every R1 spent on transformative riverine management could generate between R1.80 and R3.40 in avoided municipal infrastructure damage costs and broader societal benefits (including protection of the city's coastal economy). This investment could also create over 9,000 new permanent jobs. It also showed that by implementing a transformative riverine governance approach at a cost of R719 million over 20 years, eThekwini Municipality could unlock R4.5 billion in co-investment from private landowners, other government and third parties. It further suggested that there was a strong case for upscaling the city's existing Sihlanzimvelo Stream Cleaning Programme, with incremental phasing in of transformative approaches over time.

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Water reuse and informal communities

Parameter	Results : influent (river) vs effluent (composite from cells)
E.Coli (Counts / 100 ml) cfu	Influent upper range 80 000 -120 000 to <8
Orthophosphate PO_4^{-3} mg/L	Influent upper range 4.5 to 6.5 to <0.8
Ammonia-Nitrogen NH_3-N mg/L	Influent upper range between 30 to 40 to <1.2

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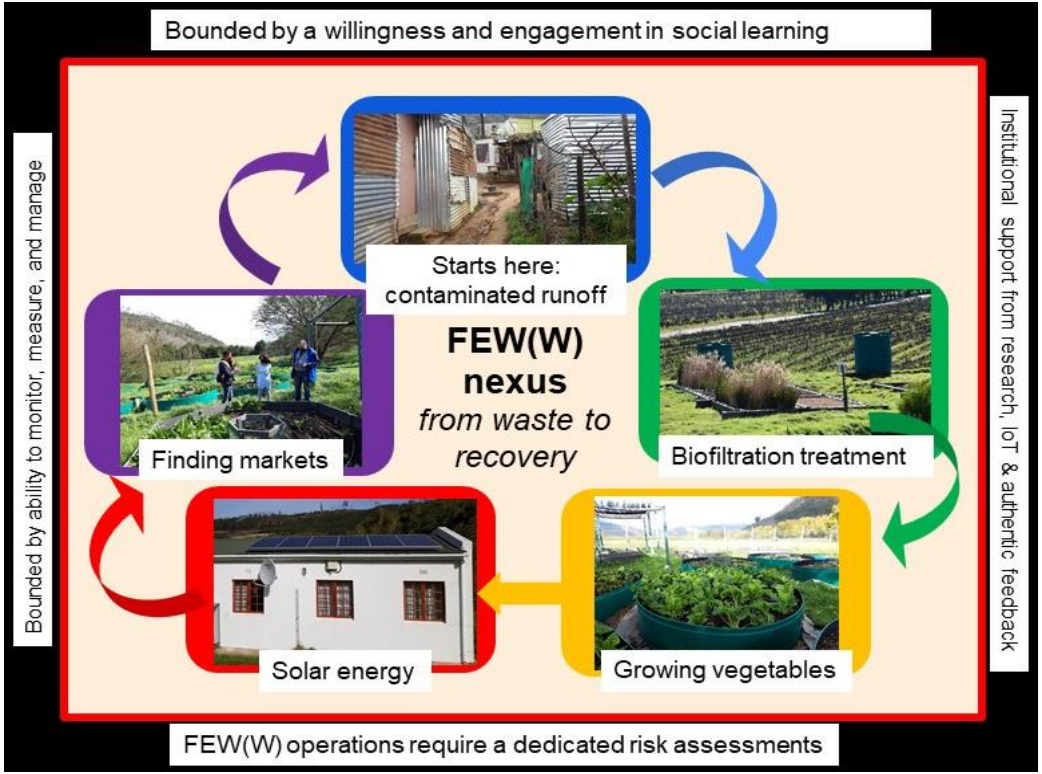
The Water Hub, Franschhoek



To what extent can nature-based treatment processes clean and treat contaminated surface water from an informal settlement and ensure safe reuse of the water for other purposes?

- Feld scale **research and demonstration site for** developing better understanding of green infrastructure
- **Water as catalyst** for developing social enterprises / benefits for urban poor; availability and quality depends on managing risk
- **Underestimated nature's ability** to treat water

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https://www.youtube.com/watch?v=ibCnOfMmM08

Stormwater harvesting – cities as supply catchments

Pathways to water resilient South African cities project

- Potential for repurposing stormwater ponds in CT to allow for harvesting (and treatment) of contaminated surface runoff through MAR
- Effectiveness of WSD elements implemented in developments in JHB
- Enabling governance environment for increased water resilience
- Pathways for physical and institutional integration of WSD into the urban water cycle

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UNIVERSITY OF COPENHAGEN

Pathways to water resilient South African cities

A renewed approach

- Integrated water management approach needed with practical/actionable roadmaps
- Urban water cycle intrinsically connected to wider catchment and users – ecological infrastructure approaches required
- Innovative means of addressing contaminated surface runoff from unserviced settlements to be explored and implemented
- WSD-specific skills and proof of concept case studies / demonstrations lead to increased confidence
- Different approaches to stormwater management will address both water supply and serious water quality issues in urban settlements - water supply diversification with fit-for-purpose water
- Opportunities and challenges for implementing water and sanitation sensitive interventions - Enabling governance, political and legislative elements necessary

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